

LAWRENCE LIVERMORE REPORT

A weekly collection of scientific and technological achievements from Lawrence Livermore National Laboratory: Feb. 8 – Feb. 16, 2010

Making the Marshall Islands inhabitable



A transport ship brings equipment to the Marshall Islands.

Through Laboratory soil cleanup methods, residents of Bikini, Enjebi and Rongelap Islands -- where nuclear tests were conducted on the atolls and in the ocean surrounding them in the 1950s -- could have lower radioactive levels than the average background dose for residents in the United States and Europe.

Laboratory scientists Bill Robison and Terry Hamilton calculated the radiation doses for people resettling Bikini, Enjebi, Rongelap and Utrok Islands. The two found that when it rains, a portion of the soluble cesium-137 (^{137}Cs) -- an isotope of cesium -- is transported to the groundwater that lies about three meters below the soil surface. The groundwater eventually gets mixed with the ocean waters so the ^{137}Cs is lost from the soil and is not available for uptake by growing vegetation on the island. The rate of this loss process is much faster than the loss by radiological decay.

In addition, treatment of food crops with potassium reduces the ^{137}Cs concentration in edible fruits to about 5 percent of pretreatment concentrations. Potassium treatment and removal of the top 15 centimeters of soil around houses and community buildings prior to construction of new buildings to reduce external exposure where people spend most of their time -- referred to as the combined option -- could be used as a remediation strategy before resettlement, Robison said.

For more, go to

http://www.upi.com/Science_News/2010/02/11/Nuclear-test-islands-might-be-resettled/UPI-95131265922417/

Cruising down the highway while saving gas



The Laboratory is working to improve the fuel efficiency of semi trucks by testing drag-reducing devices in a giant wind tunnel at NASA Ames. The increase in fuel efficiency could save the nation more than \$10 billion annually in diesel fuel savings.

Researchers from the Lab are working with with truckmaker Navistar Inc. to develop and test the devices. Aerodynamic drag is caused from pressure differences around the vehicle. At highway speeds, a semi-truck uses more than 50 percent of the energy produced by the vehicle engine to overcome aerodynamic drag, while rolling resistance consumes roughly 30 percent of the usable energy.

The devices could increase fuel efficiency by as much as 12 percent and could prevent 36 million tons of carbon dioxide from being released into the atmosphere annually, roughly the same amount of CO₂ that is emitted from four 1-gigawatt power plants every year

For more, go to <http://www.bizjournals.com/sanfrancisco/stories/2010/02/08/daily6.html>

Diamond takes it to the limit



This time-integrated photograph shows the high-powered laser shot at the diamond target (center), which is surrounded by several instruments. Credit: Eugene Kowaluk/LLE

We've all heard that diamonds can cut through glass, but now Laboratory scientists have found Earth's hardest solid can withstand pressures just over a million atmospheres before getting crushed.

For comparison, the pressure at the center of Earth is about 3.5 million atmospheres, according to the researchers. One atmosphere is the natural pressure of air at sea-level. And the human body can withstand about 27 atmospheres, if it's applied gradually, according to the Department of Energy.

The results, which were published Jan. 22 in the journal *Physical Review B*, could help scientists understand diamond formation and how pressure affects diamonds used in high-pressure experiments.

To read the article, see the Web: <http://www.livescience.com/technology/diamond-strength-100212.html>

Modeling grass as a renewable energy source



***Brachypodium* completes the set of strategically sequenced major grass genomes from the three most economically important subfamilies of grasses.**

As the Department of Energy works toward developing sustainable sources of clean renewable energy, perennial grasses have emerged as major candidates for the commercial production of cellulosic biofuels from feedstocks.

However, little is known about the specific biological traits of the grasses that might contribute to their usefulness for energy production, in part because such grasses typically have long lifecycles and possess large, complex genomes, making them difficult to study.

Representative genomes for two of the three major subfamilies of grasses -- those that include rice, maize, sorghum and sugar cane -- have already been sequenced. Now in the Feb. 11 edition of the journal *Nature*, the International Brachypodium Initiative, a consortium that includes researchers from the Joint Genome Institute (JGI), presents the complete sequence of the wild grass *Brachypodium distachyon*. *B. distachyon*, which has many features in common with grasses, making it an ideal tool for developing grasses specifically tailored for biomass and biofuel production.

For more, go to http://www.jgi.doe.gov/News/news_10_02_10.html

Latest *Newsline* available



Newsline provides the latest Lab research and operations news. See the most recent issue at <https://newsline.llnl.gov>

Photo of the week



Cyber bugs beware: Computation scientists Tina Eliassi-Rad and Keith Henderson are working on ways to better understand the behavior of large scale networked systems to protect computer networks.

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance.

To send input to the Livermore Lab Report, send e-mail <mailto:labreport@llnl.gov>.

The *Livermore Lab Report* archive is available at:
https://publicaffairs.llnl.gov/news/lab_report/2010index.html

